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12a. DISTRIBUTION / AVAILABILITY STATEMENT

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13. ABSTRACT ***(Maximum 200 Words)***

A new class of highly efficient organo-lanthanide complexes for a variety of photonic applications have been developed. Also, processing (fiber formation, radiation-induced curing) and polymeric materials development and performancecharacterization for future multiperformance materials was carried out.

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Progress Report

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Grant Number F49620-00-1-0113

"Polymeric Chelates for Optical Amplification and Lasing Applications"

A. Please provide a (no more than) one page summary of the progress and a description of important accomplishments in your program with AFOSR. The accomplishments should be something with significant impact (please be specific about the impact), and not just a list of things that were done.

We have developed highly efficient organolanthanide complexes for a variety of photonic applications. Within the past year, we have developed a new class of organolanthanides that employ 4-acylisoxazolone and 4-acylpyrazolone ligands. These new ligands aromatize upon lanthanide binding, and thus result in the creation of a pi-system manifold with which to photosensitize the lanthanide ion by nonradiative energy transfer. Furthermore, these ligands are extremely versatile in their chemical design, from which adequate steric bulk can be incorporated to ensure the prevention of concentration quenching. Also, we have synthesized some of these ligands that are devoid of C-H bonds, and result in organolanthanides with enhanced quantum yields of emission and extended excited state lifetimes. This has important implications in optical signal amplification and organic solid-state lasers. One example of these compounds is shown in Figure 1.

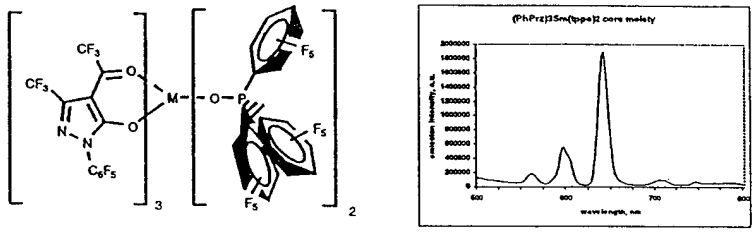

Figure 1. A europium chelate with 4-acylpyrazolone ligands. Note that there are no C-H bonds in the molecule. Also shown is the associated emission spectrum when excited into the pyrazole π–π^* transition.

We have also incorporated organolanthanides in conjugated polymers to harvest triplet excited states for light production. One major problem with traditional photo- and electroluminescent polymers is that three out of four excited states that are generated are triplet, and do not lead to emission. By transferring the triplet excited state energy to a luminescent lanthanide, all excited-state energy in the material can result in the production of light, leading to a brighter and more efficient device. We have doped the conjugated polymer poly(2-benzoyl-1,4-phenylene) with various organolanthanides and have shown emission from the lanthanides that could only come from triplet energy harvesting from the polymer. An example is shown in Figure 2.

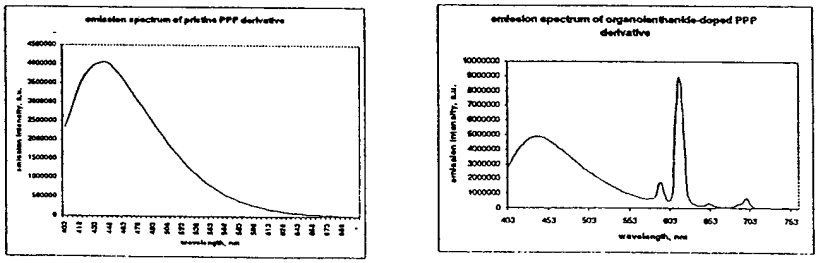

Figure 2. Left: Emission spectrum of the pristine PPP polymer (in $CHCl_3$), showing singlet emission. Right: Emission spectrum of the same polymer doped with $(hfa)_3Eu$, showing both singlet emission and lanthanide emission arising from triplet photosensitization. ($(hfa)_3Eu$ is incapable of emission by direct excitation).

We are continuing along these lines by not only designing appropriate organolanthanide dopants for other conjugated polymers, but are also covalently incorporating organolanthanides as integral components of conjugated polymers.

B. Provide program statistics as outlined below:

(1) Number of PI and Co-PI involved in the research project: 1

Aaron W. Harper

(2) Number of Post Doc Supported in the last 12 months under AFOSR: 0

(3) Number of graduate students supported in the last 12 months by AFOSR: 2

Patrick J. Case, Sean O. Clancy

(4) Other researchers supported in the last 12 months by AFOSR: 0

(5) Number of publications by PI's in the last 12 months period in refereed journals: 1

Zhang, C.; Spells, D.S.; Dalton, L.R.; Harper, A.W., "A facile synthesis of 5-*N,N*-bis(2-hydroxyethyl)amino-2-thiophenecarboxaldehyde," *Synth. Commun.*, 30, 1359-1364(2000)

(6) Number of publications in the last 12 months (in refereed journals only) that acknowledge AFOSR supports: 1

(see #5, above)

(7) Awards and Honors received by the PI (life-time received):

Beckman Young Investigator Award, 2000
Presidential Early Career Award for Scientists and Engineers, 1999
Army Research Office Young Investigator Award, 1999
University of Southern California Excellence in Research Award, 1996
American Chemical Society Division of Organic Chemistry Fellowship, 1995-96
University of Southern California Excellence in Teaching Award, 1993
U.S. Department of Education Fellowship in Areas of National Need, 1992-93
American Institute of Chemists Most Outstanding Student Award, 1992
ACS Student Affiliate Chapter President, UWRF, 1991-92 (National Recognition Award for Outstanding Chapter, 1992)
Ted and Georgia Setterquist Chemistry Scholarship, 1991

C. Report transitions in the format outlined below. A transition item is defined as some research results that were used by technology developers for specific technology development.

a. PI/Institution, b. Item of transition (research results being transitioned), c. Transition to (include Institution, name and phone number of individual(s)), d. Military applications which transistion result is being used for.
N/A